

FORWARD

ATPD 2294 for the Advanced Aviation Forward Area Refueling System states that "The AAFARS shall be configured and stored in 1 TRICON container(s) for fast deployment. TRICON container(s) shall be provided for each AAFARS and shall be in accordance with ATPD 2298, dated 20 December 2001".

The US Army currently is procuring a large number of TRICON containers from Charleston Marine Containers Incorporated (CMCI) of Charleston South Carolina. These containers are being procured in accordance with a different version of ATPD 2298. The purpose of this deviation is to identify and list the differences between the Qualified TRICON container and the requirements of ATPD 2298 dated 20 December 2001. Included is the engineering rationale for accepting the qualified TRICON containers, for transporting the AAFARS systems, as they have been qualified by CMCI.

DISCUSSION

A number of differences exist between ATPD revision 1 and the unit qualified by CMCI. The majority of which relate to the testing of the container for such items as corrosion protection, coating adherence, weather resistance etc. There are also a number of minor differences dealing with sealing, labeling, number of tie downs and number of vertical industry tracks per TRICON. The following discussion addresses each of these items individually.

3.2.2 Protection And Coating Adherence.

ATPD 2298 Rev 1 states. "A proposed alternate design shall be compared to a galvanized sample (as described above) using ASTM D522 and GM 9540P (Accelerated Corrosion Test) Method B 120 cycles, or until prior failure of one of the items with defects such as extensive corrosion, a scribe or significant penetration of base material".

The qualified TRICON was tested in accordance with ASTM D 5894-96 substituted with a Gravelometer Test. The Multi-Tes Gravelometer is designed for testing automotive materials and coatings for resistance to gravel impact.

The GM 9540P accelerated test is a combination of salt fog and high humidity test. The test applies a 1.25% salt solution as a mist in four consecutive intervals over a 4.5 hour period followed by eight hours in high humidity @ $49 \pm 2^\circ\text{C}$ and an eight-hour dryoff at $60 \pm 2^\circ\text{C}$. A 24-hr test period constitutes one test cycle.

ASTMD 5894-96 test is a combination of alternating periods of fluorescent UV/condensation and cyclic salt fog/dry chamber.

ASTMD 5894-96 "that no single exposure test can be specified as a complete simulation for actual use conditions in outdoor environments". "Therefore even if results from a specific article test are found to be useful for comparing the relative durability of materials exposed in a particular exterior environment it

cannot be assumed that they will be useful for determining relative durability for a different environment".

The ATPD attempts through the use of the ASTM testing to verify that the durability of the coating provided by CMCI is adequate to protect the TRICON container from most environments. Both testing methods attempt to replicate an accelerated rate of the actual conditions the TRICON will be exposed to. Substituting ASTM D 5894-98 with ASTM D522 and ASTM D540P does not guarantee that coating adherence is better or worse only that under the conditions tested was a particular specimen found to be acceptable.

3.3.3 Side Walls And End Walls.

ATPD 2298 Rev 1 states Strength requirements for containers shall meet ISO 1496-1. The end walls and side walls shall withstand loading in accordance with ISO 1496-1 with payload (P_g) of 12,200 pounds.

The qualified TRICON strength requirements were in accordance with ISO 1496-1, which is as follows "Strength requirements for containers shall meet ISO 1496-1. The end walls and sidewalls shall withstand loading in accordance with ISO 1496-1". The only difference being the stipulation of the 12,200 internal load.

ISO 1496-1 states that for the strength of end wall test the container shall have an internal loading of $0.4 P_g$ or 4/10ths of the maximum payload. For the strength of sidewalls test the container shall have an internal loading of $0.6 P_g$ or 6/10ths of the maximum payload.

The loading test for the qualified TRICON was performed for both test with an internal load of 0.6. The unit was tested and passed with a load in excess of the requirements of ISO 1496-1.

3.3.5 Roof

ATPD 2298 Rev 1 states "The roof shall be self-draining and its roof strength (per ISO 1496-1) shall allow less than 1/4 inch deflection. When the TRICON is tested in accordance with 1496-1, Weatherproofness test, and is level to within 5 degrees, the roof shall retain not more than 1/8 inch of water in an hour.

The qualified TRICON requirement was "The roof shall be self-draining and the roof strength (per ISO 1496-1) shall meet the requirements of ISO 1496-1.

There has been no change to the loading of the roof during testing only that it should have less than 1/4 inch deflection when tested. The unit was tested and passed the requirements of ISO 1496-1 with the exception that no deflection is specified by ISO 1496-1.

The additional requirement during the "weatherproofness test", the unit should be "level within 5 degrees", and "the roof shall retain no more than 1/8 inch of water and hour". This is specifying a condition of the test not changing the design or manufacture of the container.

The qualified container met the conditions of ISO 146 3-1, the weatherproofness, which states "Upon completion of the test no water at all have leaked into the container".

3.3.8 Seams.

ATPD 2298 Rev 1 states "All TRICON seams shall be permanent. Seams shall be sealed with AMS 3378".

The qualified unit did not have this specific requirement but was qualified in accordance with the weatherproofness test of ISO 146 3-1 which states "no water shall have leaked into the container" as acceptance criteria for the test which the unit successfully passed.

3.3.9 Universal Shelving Brackets

ATPD 2298 Rev 1 states "Each TRICON shall contain three Series E vertical tracks"

The qualified unit contains five Series E vertical tracks

Other than the additional weight from 2 vertical tracks there is added versatility by being able to adjust the shelving and loading layout for weight and balance of the container. A requirement of the helicopter sling demonstration.

3.4.4 Tie-downs.

ATPD 2298 Rev 1 states "A total of 34 tie-downs shall be provided in each container as depicted in Figure 1. Four tie-downs shall be provided and welded on the bottom rail and four on the top rail of each end wall and five tie-downs on each corner post opposite the door opening".

The qualified unit requirements are "A total of 36 tie-downs shall be provided in each container as depicted in Figure 1. Four tie-downs shall be provided and welded on the bottom side rail and four on the top side rail of each side wall 5 each top and bottom front end rail and five tie-downs on each corner post opposite the door opening".

Other than the additional weight from 2 tie-downs there is added versatility by being able to adjust the shelving and loading layout for weight and balance of the container. A requirement of the helicopter sling demonstration.

3.4.7 Convention for Safe Containers (CSC) certification.

ATPD 2298 Rev 1 states The TRICON container design and each TRICON shall be certified in accordance with 49 CFR, Parts 450 through 459. The Nine High Stacking Test shall be for three (3) TRICONS coupled together supporting a stack of eight fully loaded ISO 668, 1C containers.

CMCI states that the "TRICON was certified by Lloyd's Register North America, Inc., approved by the U.S. Coastguard.

3.5.1 Chemical Agent Resistant Coating (CARC)

ATPD 2298 Rev 1 states 3.5.1 CARC paint shall be in accordance with MIL-C-53072 on all exterior surfaces of the container except for the connecting couplers.

The qualified unit requirement is CARC paint shall be in accordance with MIL-C-53072 or MIL-DTL-84159, type 1, on all exterior surfaces of the container except for the connecting couplers.

MIL-DTL-84159 is the specification for CARC paint where MIL-C-53072 specifies the application of the CARC paint. Provided the correct paint was applied in accordance with the suppliers directions the unit should be acceptable.

3.5.6 Consolidated data plate

ATPD 2298 Rev 1 states "The Consolidated Data Plate shall be in accordance with ISO 6359. The height of the data plate should remain at or near the minimum 200 mm specified in the ISO. The location of the consolidated data plate shall be as depicted in Figure 3".

CMCI states that specification ISO 6359 does not exist, BAE SYSTEMS was also unable to locate a copy of ISO 6359. It was deleted and replaced by the following, which was added to section 3.5.6 "Figure 4.5D and Figure 4.5E of MIL-HDBK-138A shall be used for guidance for the format of the Consolidated Data Plate. The location of the data plate shall be as depicted in Figure 3.

The CMCI data plate dimensions are 258 (high) X 210 (wide) and in the location depicted in figure 3.

4.5.3 Corrosion test

ATPD 2298 Rev 1 states "The TRICON shall be evaluated for corrosion prevention and control by the GM 9540P accelerated corrosion test for 120 cycles. A sample construction of part of a TRICON container to include the doors, four corners and at least three feet of roof, floor and side wall extension from the doors may be tested if desired, instead of a complete TRICON, to reduce test chamber size required. Four connecting couplers shall also be tested. Nonconformance to 3.2.1 shall constitute failure of this test".

The qualified unit was tested in accordance with ASTM D5894-96. Coupons provided by CMCI, to Sherwin-Williams Laboratory facility, were tested to verify the TRICONS corrosion resistance.

As discussed in section 3.2.2 the requirements of both tests are extreme and attempt to simulate, in an accelerated manner, how the container will hold up in an external environment. Both tests are performed in a similar fashion but neither test assures the containers resilience to all environments, only to the environments tested. Once again it was the method of test that changed not the design of the container.

6.6 Manifest box.

CMCI states that the company, for the manifest box, is on the approved supplier list does not make the size of manifest box required.

Penz Products, 1320 S. Merrifield Avenue, Mishawaka, Indiana 46544-5707, Phone (219) 255-4736, Steel Division Fax: (219) 255-7238.

CONCLUSION

The container currently being procured by the US Army appears to be adequate for the job required. The re-qualification of a new TRICON container would incur costs for qualification testing but not guarantee a superior product to that currently being procured. The building of the containers is identical, with some slight variations of interior features. The methods of testing are similar and all are approved by the American Society for Testing and Materials and it is the consensus of BAE SYSTEMS that these differences are negligible. The TRICON containers built by CMCI are certified by Lloyd's Register North America Inc, approved by U.S. Coastguard and will perform as required and be adequate for transporting and protecting the AAFARS systems from the external environment.

Besides the design differences there is the additional advantage of commonality. Having a different qualified container for the AAFARS systems would require a separate National Stock Number (NSN) along with special marking, tracking and handling to assure that no AAFARS systems inadvertently get shipped in a "nonconforming container". Keeping the containers separated would be a logistical nightmare and in all probability the soldier in the field would not recognize the differences between the containers and would inadvertently mix them anyway.